

JC20 Rec'd PCT/PTO 19 OCT 2001

Practitioner's Docket No. Dunlop Tire - Gatti

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

**TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)
(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)**

INTERNATIONAL APPLICATION NO.

PCT/US99/08838

INTERNATIONAL FILING DATE

22 April 1999

PRIORITY DATE CLAIMED

22 April 1999

TITLE OF INVENTION

VULCANIZABLE ELASTOMERIC COMPOSITIONS FOR USE AS TIRE TREADS

APPLICANT(S)

GATTI, Louis F.

Box PCT

Assistant Commissioner for Patents

Washington D.C. 20231

ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*

(When using Express Mail, the Express Mail label number is mandatory;
Express Mail certification is optional.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

- ☐ deposited with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

37 C.F.R. § 1.8(a)

37 C.F.R. § 1.10 *

- ☐ with sufficient postage as first class mail.

☒ as "Express Mail Post Office to Addressee"

Mailing Label No. EL558325335US (mandatory)

TRANSMISSION

- ☐ facsimile transmitted to the Patent and Trademark Office, (703) _____


Signature

Date: October 19, 2001

Peter K. Sommer, Reg. No. 26,587

(type or print name of person certifying)

* Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

- I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:
- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
 - b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input type="checkbox"/>	TOTAL CLAIMS	19 -20=	-0-	× \$18.00=	\$ -0-
	INDEPENDENT CLAIMS	1 -3=	-0-	× \$80.00=	-0-
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00				
BASIC FEE**	<input checked="" type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) \$100.00 <input checked="" type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) \$690.00 <input type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$710.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) \$1000.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$860.00				690.00
	Total of above Calculations				= 690.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Assertion must be made. (note 37 C.F.R. § 1.27)				-
	Subtotal				690.00
	Total National Fee				\$690.00
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				40.00
TOTAL	Total Fees enclosed				\$ 730.00

*See attached Preliminary Amendment Reducing the Number of Claims.

- ☐ Attached is a ☐ check ☐ money order in the amount of \$ _____
- ☐ Authorization is hereby made to charge the amount of \$ _____
- ☐ to Deposit Account No. _____
- ☐ to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: Credit card information should not be included on this form as it may become public.

- ☐ Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

****WARNING:** "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

WARNING: If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

☐ **Assertion of Small Entity Status**

☐ **Applicant hereby asserts status as a small entity under 37 C.F.R. § 1.27.**

NOTE: 37 C.F.R. § 1.27(c) deals with the assertion of small entity status, whether by a written specific declaration thereof or by payment as a small entity of the basic filing fee or the fee for the entry into the national phase as states:

"(c) Assertion of small entity status. Any party (person, small business concern or nonprofit organization) should make a determination, pursuant to paragraph (f) of this section, of entitlement to be accorded small entity status based on the definitions set forth in paragraph (a) of this section, and must, in order to establish small entity status for the purpose of paying small entity fees, actually make an assertion of entitlement to small entity status, in the manner set forth in paragraphs (c)(1) or (c)(3) of this section, in the application or patent in which such small entity fees are to be paid.

(1) Assertion by writing. Small entity status may be established by a written assertion of entitlement to small entity status. A written assertion must:

(i) Be clearly identifiable;

(ii) Be signed (see paragraph (c)(2) of this section); and

(iii) Convey the concept of entitlement to small entity status, such as by stating that applicant is a small entity, or that small entity status is entitled to be asserted for the application or patent. While no specific words or wording are required to assert small entity status, the intent to assert small entity status must be clearly indicated in order to comply with the assertion requirement.

(2) Parties who can sign and file the written assertion. The written assertion can be signed by:

(i) One of the parties identified in §§ 1.33(b) (e.g., an attorney or agent registered with the Office), §§ 3.73(b) of this chapter notwithstanding, who can also file the written assertion;

(ii) At least one of the individuals identified as an inventor (even though a §§ 1.63 executed oath or declaration has not been submitted), notwithstanding §§ 1.33(b)(4), who can also file the written assertion pursuant to the exception under §§ 1.33(b) of this part; or

(iii) An assignee of an undivided part interest, notwithstanding §§ 1.33(b)(3) and 3.73(b) of this chapter, but the partial assignee cannot file the assertion without resort to a party identified under §§ 1.33(b) of this part.

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(3) Assertion by payment of the small entity basic filing or basic national fee. The payment, by any party, of the exact amount of one of the small entity basic filing fees set forth in §§ 1.16(a), (f), (g), (h), or (k), or one of the small entity basic national fees set forth in §§ 1.492(a)(1), (a)(2), (a)(3), (a)(4), or (a)(5), will be treated as a written assertion of entitlement to small entity status even if the type of basic filing or basic national fee is inadvertently selected in error.

(i) If the Office accords small entity status based on payment of a small entity basic filing or basic national fee under paragraph (c)(3) of this section that is not applicable to that application, any balance of the small entity fee that is applicable to that application will be due along with the appropriate surcharge set forth in §§ 1.16(e), or §§ 1.16(f).

(ii) The payment of any small entity fee other than those set forth in paragraph (c)(3) of this section (whether in the exact fee amount or not) will not be treated as a written assertion of entitlement to small entity status and will not be sufficient to establish small entity status in an application or a patent."

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☒ is transmitted herewith.
- b. ☒ is not required, as the application was filed with the United States Receiving Office.
- c. ☐ has been transmitted
 - i. ☐ by the International Bureau.

Date of mailing of the application (from form PCT/1B/308):

- ii. ☐ by applicant on _____. (Date)

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☐ is transmitted herewith.
- b. ☒ is not required as the application was filed in English.
- c. ☐ was previously transmitted by applicant on _____. (Date)
- d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☒ are transmitted herewith.
- b. ☐ have been transmitted
 - i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308):

 - ii. ☐ by applicant on _____ (Date)
- c. ☐ have not been transmitted as
 - i. ☐ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.):

 - ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):
- a. ☐ is transmitted herewith.
 - b. ☒ is not required as the amendments were made in the English language.
 - c. ☐ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)
- ☒ is transmitted herewith.
 - ☐ is not required as the application was filed with the United States Receiving Office.

8. ☐ Annex(es) to the international preliminary examination report
- a. ☐ is/are transmitted herewith.
 - b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report
- a. ☐ is transmitted herewith.
 - b. ☐ is not required as the annexes are in the English language.

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10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115
- a. ☐ was previously submitted by applicant on _____. (Date)
 - b. ☒ is submitted herewith, and such oath or declaration
 - i. ☒ is attached to the application.
 - ii. ☒ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
 - c. ☐ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☐ is transmitted herewith.
 - b. ☒ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____
 - c. ☒ is not required, as the application was searched by the United States International Searching Authority.
 - d. ☐ will be transmitted promptly upon request.
 - e. ☐ has been submitted by applicant on _____. (Date)
12. ☐ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:
- a. ☐ is transmitted herewith.

Also transmitted herewith is/are:

- ☐ Form PTO-1449 (PTO/SB/08A and 08B).
 - ☐ Copies of citations listed.
 - b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
 - c. ☐ was previously submitted by applicant on _____. (Date)
13. ☒ An assignment document is transmitted herewith for recording.

A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

Dunlop Tire Corporation

14. ☒ Additional documents:

- a. ☐ Copy of request (PCT/RO/101)
- b. ☒ International Publication No. WO 00/64968
 - i. ☒ Specification, claims and drawing
 - ii. ☐ Front page only
- c. ☐ Preliminary amendment (37 C.F.R. § 1.121)
- d. ☐ Other

15. ☒ The above checked items are being transmitted

- a. ☒ before 30 months from any claimed priority date.
- b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☐ Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:

- ☐ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

- ☐ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

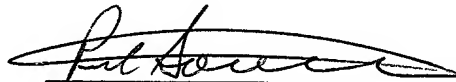
NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

- ☐ 37 C.F.R. § 1.17 (application processing fees)
- ☐ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).
- ☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

- ☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).



SIGNATURE OF PRACTITIONER

Peter K. Sommer

(type or print name of practitioner)

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UNDER THE PATENT COOPERATION TREATY
IN THE UNITED STATES RECEIVING OFFICE

In re Application of:

Applicant: LOUIS F. GATTI

Application No.: PCT/US99/08838

Filed: 22 April 1999

For: VULCANIZABLE ELASTOMERIC
COMPOSITIONS FOR USE AS TIRE TREADS

AMENDMENT

Hon. Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Attention: Dr. Callie Shosho

Dear Sir:

In response to the Examiner's Written Opinion dated 5 April 2001, kindly amend this application as follows:

IN THE CLAIMS:

Cancel claims 8 and 15 without limitation, admission or prejudice.

Rewrite claims 1, 7 and 14 as follows:

1. (Twice Amended) A tire tread, comprising:

100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least [about] 7 phr of zinc sulfate to modify the viscoelastic properties of said elastomer.

7. (Twice Amended) A tire tread, comprising:

100 parts by weight of at least one diene-based elastomer; and

from about 30 to about 160 phr of filler, said filler comprising at least about 7 phr of barium sulfate[11], [and] wherein the aggregate amount of barium sulfate in said filler is less than about 30 percent of the volume of said filler and the aggregate amount of barium sulfate is between about 10 and about 30 percent by weight of said filler, and wherein the mean particle size of said barium sulfate is between about 1.0 and about 2.0 microns to modify the viscoelastic properties of said elastomer.

14. (Twice Amended) A tire tread, comprising:

100 parts by weight of at least one diene-based elastomer; and

from about 30 to about 160 phr of filler, said filler comprising at least about 8 phr of titanium dioxide, the mean particle size of said titanium dioxide being between about 0.5 and about 1.0 microns, and wherein the aggregate amount of titanium dioxide in said filler is less than about 30 percent of the volume of said filler and the aggregate amount of titanium dioxide is between 10 and about 30 percent by weight of said filler to modify the viscoelastic properties of said elastomer.

Remarks

This Amendment is responsive to the Examiner's Written Opinion written 5 April 2001.

Briefly, claims 8 and 15 have been cancelled, without limitation, admission or prejudice. Independent claims 1, 7 and 14 have been rewritten.

In the Written Opinion, the Examiner stated that claims 1-10 and 13-17 were novel, and possessed industrial applicability. However, she indicated that the claims lacked an "inventive step", (*i.e.*, would have been "obvious") for various reasons.

As the Examiner is well aware, this application contains only three independent claims, namely, claims 1, 7 and 14.

For the Examiner's convenience, this amendment will be structured along the lines of the three independent claims and their respective trailing progeny. Within these three groups, attention will be focused primarily on the various independent claims. If these claims distinguish patentably from the prior art, then each of their trailing dependent claims must necessarily so distinguish. *Ex parte Leavell* (Bd. App. 1979); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Claims 1-6

As the Examiner is well aware, claim 1 is in independent form, and claims 2-6 are severally

dependent, either directly or indirectly, on independent claim 1.

In the recent Written Opinion, the Examiner opined that claims 1-6 lacked an "inventive step" over Smigerski *et al.* (U.S. 4,788,231). Here, the Examiner said:

"Smigerski *et al.* disclose a tire tread comprising 100 parts diene based elastomer and filler comprising 40-250 phr carbon black and 0.1-6.5 phr zinc sulfate (col. 2, lines 38-51, col. 3, lines 26-56 and 61-62, and col. 5, line 32).

Although the present claims require that the tire tread comprise at least 7 phr zinc sulfate and Smigerski *et al.* disclose 6.5 phr zinc sulfate, given that the instantly claimed amount of zinc sulfate and that disclosed by Smigerski *et al.* are so close to each other it would have been obvious to one of ordinary skill in the art, absent evidence of criticality, that (i) the zinc sulfate disclosed by Smigerski *et al.* would have the same properties and similar functions as the zinc sulfate presently claimed and (ii) that the amount of zinc sulfate disclosed in the present claims is but an obvious variant of the amount disclosed by Smigerski *et al.*, and thereby one of ordinary skill in the art would have arrived at the claimed invention." (Emphasis added.)

In response to the foregoing, claim 1 has been amended to delete the word "about" as modifying the amount of zinc sulfate. Claim 1 as now amended, specifically requires that there be at least 7 phr of zinc sulfate to modify the viscoelastic properties of the elastomer. As the Examiner has conceded that Smigerski discloses a tire tread composition having 0.1-6.5 phr of zinc sulfate. However, there is no teaching in this reference of increasing the amount of zinc sulfate from 6.5 phr to at least 7 phr, an increase of almost 8%.

As the Examiner is well aware, the references themselves must teach or suggest the combination claimed. "Obvious to try" is not the appropriate standard. *See, e.g., In re Fine, supra* at 1075, 5 USPQ2d at 1599 ["whether a particular combination might be 'obvious to try' is not a legitimate test of patentability"]; *Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720, 725, 16 USPQ2d 1923, 1928 (Fed. Cir. 1990) ["we have consistently held that 'obvious to try' is not to be equated with obviousness under 35 UC 103"].

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In the case-at-bar, the only teaching of providing zinc sulfate in an amount of at least 7 phr comes not from the prior art references, but from applicant's own disclosure. Here, we are immediately reminded of the frequent admonition that the Examiner is to avoid using hindsight to reconstruct the prior art with the specific knowledge of where he is heading. Borrowing from mythology, if Jason had known of the location of the Golden Fleece, he could have shortened his journey in search thereof significantly. Returning now to more recent times, the Federal Circuit has admonished that we are to avoid hindsight reconstruction of the prior art. In *W. L. Gore & Associates v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. Denied*, 469 U.S. 851 (1984), Judge Markey said:

"To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim of the insidious effect of a hindsight syndrom wherein that which only the inventor taught is used against its teacher." (702 F.2d at 1012, 217 USPQ at 199.)

* * *

"It is difficult but necessary that the decision maker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made (often has here many years), to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." (721 F.2d at 1553, 220 USPQ at 313.)

Here, the Examiner has not suggested that any of the prior art references themselves (*i.e.*, within their "four corners") teach or suggest that the amount of zinc sulfate should be increased above Smigerski's specific range of 0.1-6.5 phr, to "at least 7 phr" as set forth in claim 1. Moreover, the Examiner has not demonstrated that a person skilled in the art would have perceived or appreciated any inadequacy or deficiency in Smigerski that would motivate such person to modify Smigerski's specific range of zinc sulfate. Absent such a motivation, the mental modification contemplated

by the Examiner is improper. *In re Wright*, 848 F.2d 1216, 6 USPQ2d 1959 (Fed. Cir. 1988).

Accordingly, twice amended claim 1 is believed to distinguish patentably from the prior art.

The Examiner also rejected dependent claim 4 for alleged "obviousness" over Smigerski in view of Shimizu (U.S. Pat. No. 5,508,333). Here, the Examiner said:

"The difference between Smigerski et al. and the present claimed invention is the requirement in the claim of silica.

Shimizu which is drawn to tire tread composition, disclose the use of silica filler in order to improve fracture properties, wet grip, and rolling resistance of the tire tread (col. 6, lines 56-59).

In light of the motivation for using silica disclosed by Shimizu as described above, it would therefore have been obvious to one of ordinary skill in the art to use silica in the tire tread of Smigerski et al. in order to improve fracture properties, wet grip, and rolling resistance of the tire tread, and thereby arrive at the claimed invention."

With all due respect, claim 4 is dependent on twice-amended independent claim 1. Hence, if claim 1 distinguishes patentably from the prior art, then claim 4 must similarly so distinguish.

The Examiner next rejected claims 1-6 for alleged "obviousness" over Shimizu in view of Smigerski and Umeda (U.S. Pat. No. 5,391,600). Here, the Examiner said:

"Shimizu discloses a tire tread comprising 100 parts diene based elastomer and 10-100 parts filler wherein the filler comprises 0.1-90 phr carbon black and 9.9-99.9 phr white filler such as barium sulfate or mixtures of barium sulfate and silica.

The difference between Shimizu and the present claimed invention is the requirement in the claims of (a) zinc sulfate and (b) particle size of zinc sulfate.

With respect to difference (a), Smigerski et al., which is drawn to tire treads, disclose the equivalence and interchangeability of zinc sulfate with barium sulfate wherein these metal salts are used to prevent particle segregation during processing (col. 1, lines 47-62, col. 2, lines 20-23, and col. 3, line 37).

In light of the disclosure of Smigerski et al., it would therefore have been obvious to one of ordinary skill in the art to use zinc sulfate as the filler in the tire tread of Shimizu in order to ensure effective processing, and thereby arrive at the claimed invention.

With respect to difference (b), Umeda et al., which is drawn to

resin composition, disclose the use of zinc sulfate having particle size less than 1 micron. The motivation for using zinc sulfate with such particle size is that it has superior smoothness of surface (col. 5, lines 25-31).

In light of the motivation for using zinc sulfate with particular particle size disclosed by Umeda et al. as described above, it would therefore have been obvious to one of ordinary skill in the art to use such zinc sulfate in the tire tread of Shimizu, and thereby arrive at the claimed invention."

With all due respect to the Examiner, Shimizu discloses a type of polymer material for use as a tire tread, that includes a filler such as white carbon. Applicant's attorney is unaware of any such substance. However, in col. 16, line 47 *et seq.*, Shimizu does speak of the use of barium sulfate as a filler material. However, the total amount of filler, including barium sulfate and whatever else may be present, is in the range of 10-100 phr. The Examiner has indicated that Shimizu teaches 9.9-99.9 phr of "white filler". However, this appears to be clearly erroneous. In column 17, line 20, Shimizu speaks of adding 9.9-99.9 parts by weight of white carbon, not "white filler". Hence, it is believed that the Examiner has misconstrued this reference. Moreover, her attempted reliance on a secondary reference to purportedly provide a stimulus for increasing the amount of zinc sulfate, is illustrative of the fact that the Shimizu reference does not contain any such teaching, as discussed *infra*.

The Examiner has also opined that one would be motivated to use zinc sulfate in lieu of barium sulfate because of its superior smoothness of surface. What does that come from? There is no teaching in the present application of the use of such material for its smoothness of surface? What is wrong with Smigerski's composition that would motivate a person skilled in the art to look to some other reference, such as Shimizu, to try to modify Smigerski's basic teaching? Moreover, it is pointed out that the third reference, Umeda, is not drawn to a tire tread composition, but to a

"polycarbonate resin composition". Why would someone who is desirous of improving a tire tread composition, have any motivation to look to the "polycarbonate resin composition" art to look for solutions to perceived common problems. The answer is that there is no such motivation. Hence, the Examiner's reliance on Umeda is believed to be misplaced.

Accordingly, claims 1-6 are believed to be in condition for allowance.

Claims 7 and 9-10

The Examiner rejected these claims for alleged "obviousness" over Shimizu in view of Craven (U.S. Pat. No. 3,878,147). Here, the Examiner said:

"Shimizu discloses a tire tread comprising 100 parts diene based elastomer and 10-100 parts filler wherein the filler comprises 0.1-90 phr carbon black and 9.9-99.9 phr white filler such as barium sulfate or mixtures of barium sulfate and silica. There is also disclosed a silane coupling agent to reinforce the white pigment (col. 16, line 41-col. 17, line 23 and col. 17, line 28).

The difference between Shimizu and the present claimed invention is the requirement in the claims of the particle size of barium sulfate.

Craven, which is drawn to tire tread treads, disclose the use of particles such as barium sulfate having particle size of 0.2-105 microns in order to provide the necessary level of friction to the tire (col. 2, lines 8, 13, and 16-18).

In light of the motivation for using barium sulfate with particular particle size disclosed by Craven as described above, it would therefore have been obvious to one of ordinary skill in the art to use such barium sulfate in the tire tread of Shimizu in order to control the level of friction, and thereby arrive at the claimed invention."

With all due respect to the Examiner, the Shimizu reference calls for 9.9-99.9 phr of white carbon, not "white filler". As mentioned above, Shimizu discloses a tire tread composition in which the total amount of filler is from 10-100 phr. However, the composition may have many different filler materials. Hence, the mere fact that the aggregate amount of filler must be in the 10-100 phr range, does not specifically teach the amount of barium sulfate in the range specified by applicant's

claim 7. Craven appears to disclose a type of spray-on composition that may be used to temporarily increase the traction of certain tires. However, this reference does not suggest improving the viscoelastic properties of the tire tread material itself. Rather, Craven at best contemplates a spray-on coating.

Accordingly, claims 7, 9 and 10 are believed to patentably distinguish from the teaching of the prior art.

Claims 14 and 16-17

Claim 14 has been amended to incorporate the additional limitations of original application claim 15, which has been cancelled.

The Examiner rejected these claims for alleged "obviousness" over Young (U.S. Pat. No. 5,063,268) in view of Kuan (U.S. 4,237,173). Here, the Examiner said:

"Young discloses a tire tread comprising 25-50% diene based elastomer, 20-50% carbon black, and 3-15% titanium dioxide and silica (col. 6, line 59, col. 7, line 35, and col. 7, line 67-col. 8, line 1). It is calculated from present claim 14 that the presently claimed tire tread comprises 39-77% diene based elastomer (100/260-100/130) and 23-61% filler. Thus, the amounts disclosed by Young clearly overlap those presently claimed.

The difference between Young and the present invention is the requirement in the claims of the particle size of titanium dioxide.

Kuan, which is drawn to tire composition, disclose that controlling the particle size of titanium dioxide to 0.1-0.5 microns ensures high brightness, high tinting strength, and ease of dispersion (col. 1, lines 44-47 and col. 2, lines 1-5).

In light of the motivation for using titanium dioxide with particular particle size disclosed by Kuan as described above, it would therefore have been obvious to one of ordinary skill in the art to use such titanium dioxide in the tire tread of Young in order to ensure high brightness, high tinting strength, and ease of dispersion of the pigment, and thereby arrive at the claimed invention."

With all due respect to the Examiner, Kuan is directed toward a cosmetic white sidewall

composition for a tire, not to the tire tread composition itself. White sidewalls (a/k/a "white walls") are simply decorative. More importantly, it is simply not understood why a tire designer, intent on improving the viscoelastic properties of a tire tread composition, would look to "brighten" the tire tread (*i.e.*, "where the rubber meets the road") by use of something that was used in a white sidewall. Moreover, virtually all tire tread compositions are black, not white. Here, there is simply no motivation for a person skilled in the art to attempt to draw from a reference from the tire sidewall art. With all due respect, the Examiner's reliance on this combination is believed to be illusory and unsupportable.

The Examiner further rejected these claims as being obvious over Senyek *et al.* (U.S. Pat. No. 5,310,815) in view of Kuan. Here, the Examiner said:

"Senyek *et al.* disclose a tire tread comprising 100 parts diene based elastomer and 25-125 phr filler comprising titanium dioxide, carbon black, and silica (col. 4, lines 37-40 and 62-65).

The difference between Senyek *et al.* and the present claims is the requirement in the claims of (a) specific amount of titanium dioxide and (b) particle size of titanium dioxide.

With respect to difference (a), although there is no explicit disclosure of the amount of titanium dioxide present, it would have been obvious to, as well as within the skill level of, one of ordinary skill in the art to choose amounts of titanium dioxide, including those presently claimed, in order to produce a tire tread with the desired amount of abrasion resistance and tensile strength, and thereby arrive at the claimed invention.

With respect to difference (b), Kuan, which is drawn to tire composition, disclose that controlling the particle size of titanium dioxide to 0.1-0.5 microns ensures high brightness, high tinting strength, and ease of dispersion (col. 1, lines 44-47 and col. 2, lines 1-5).

In light in of the motivation for using titanium dioxide with particular particle size disclosed by Kuan as described above, it would therefore have been obvious to one of ordinary skill in the art to use such titanium dioxide in the tire tread of Senyek *et al.* in order to ensure high brightness, high tinting strength, and ease of dispersion of the pigment, and thereby arrive at the claimed invention."

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With all due respect to the Examiner, it is difficult to perceive while a tire designer would be tempted to move titanium dioxide, commonly found as the whiting agent in the sidewall of a "white wall" tire, into the blackened tread area. Certainly the tire designer would not wish to lighten the color of the tread. Hence, there is simply no motivation to make the mental modification contemplated by the Examiner. As noted above, it appears that the Examiner has attempted to selectively reconstruct the prior art after a studied knowledge of applicant's invention. While that is a very human trait, the Examiner is charged with the duty to forget what she has just learned of applicant's invention, and to be guided by the wisdom of the prior art references themselves. Here, there is simply no motivation in the prior art references of making the modification contemplated by the Examiner.

Accordingly, claims 14 and 16-17 are believed to patentably distinguish from the prior art.

This amendment is believed to be fully responsive to the Written Opinion of 5 April 2001, to squarely address each and every ground for objection or rejection raised by the Examiner, and to materially advance prosecution of this application toward immediate allowance. Replacement sheets for the further-amended claims are attached.

Formal allowance of claims 1-7, 9-10 14, and 16-17 is, therefore, courteously solicited.

Respectfully submitted,

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CERTIFICATE OF FACSIMILE TRANSMISSION

I certify that this correspondence is being transmitted by facsimile transmission to 703-305-5885 this 4th day of May, 2001.

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Signed: May 4, 2001

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Amended Claims

1. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least 7 phr of zinc sulfate to modify the viscoelastic properties of said elastomer.
2. A tire tread as set forth in claim 1 wherein the mean the particle size of said zinc sulfate is between about 0.5 and about 1.0 microns.
3. A tire tread as set forth in claim 1 wherein the said filler includes carbon black.
4. A tire tread as set forth in claim 1 wherein the said filler includes silica.
5. A tire tread as set forth in claim 1 wherein the aggregate amount of zinc sulfate in said filler is less than about 30 percent of the volume of said filler.
6. A tire tread as set forth in claim 1 wherein the aggregate amount of zinc sulfate is between 10 and about 30 percent by weight of said filler.
7. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least about 7 phr of barium sulfate, wherein the aggregate amount of barium sulfate in said filler is less than about 30 percent of the volume of said filler and the aggregate amount of barium sulfate is between about 10 and about 30 percent by weight of said filler, and wherein the mean particle size of said barium sulfate is between about 1.0 and about 2.0 microns to modify the viscoelastic properties of said elastomer.
8. (Cancelled)

9. A tire tread as set forth in claim 7 wherein the said filler includes carbon black.
10. A tire tread as set forth in claim 7 wherein the said filler includes silica.
11. (Cancelled)
12. (Cancelled)
13. (Cancelled)
14. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least about 8 phr of titanium dioxide, the mean particle size of said titanium dioxide being between about 0.5 and about 1.0 microns, and wherein the aggregate amount of titanium dioxide in said filler is less than about 30 percent of the volume of said filler and the aggregate amount of titanium dioxide is between 10 and about 30 percent by weight of said filler to modify the viscoelastic properties of said elastomer.
15. (Cancelled)
16. A tire tread as set forth in claim 14 wherein the said filler includes carbon black.
17. A tire tread as set forth in claim 14 wherein the said filler includes silica.
18. (Cancelled)
19. (Cancelled)

VULCANIZABLE ELASTOMERIC
COMPOSITIONS FOR USE AS TIRE TREADS

5

Technical Field

This invention relates generally to vulcanizable elastomeric compounds having enhanced viscoelastic properties, and, more particularly, to improved elastomeric compositions having 100 parts by weight of at least one diene-based elastomer and from 30 to 160 phr (parts per hundred parts of rubber by weight) of fillers, which include compounds of zinc, barium and/or titanium.

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Background Art

Elastomeric compounds are so-called viscoelastic materials. This means that the properties which they exhibit depend on the duration (time or frequency) and on the temperature at which external stresses or deformations (strains) are applied to them.

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The balance and level of such viscoelastic properties determine the processibility and the range of end-use characteristics of these elastomeric compounds, and, therefore, their practical applications. With present technologies, a wide range of applications is possible due to the fact that the basic constituents of these elastomeric compounds, namely, naturally-occurring or synthetically-produced rubbers, can be mixed or compounded with numerous chemicals and other additives, so as to tailor and customize their viscoelastic properties. The technology of developing vulcanizable elastomeric compounds for specific applications has achieved a high degree of sophistication over the past years.

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As a result of developments in electronics and dynamic test equipment, great advances have also been made in the precise measurement of viscoelastic properties of elastomeric compounds, and also in the correlation of such measurements with the performance of these compounds in engineered products, such as tires.

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Pertinent viscoelastic parameters, which are measured in laboratory tests, are the elastic moduli, E' (in tension or compression) and G' (in shear), the viscous moduli E'' (in tension or compression) and G'' (in shear), and the ratio of the viscous and elastic moduli, otherwise known as the loss tangent or $\tan \delta$. These parameters are determined

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under dynamic conditions at specific temperatures, frequencies, strain rates, and stress- or strain- amplitudes. Another important parameter is the glass transition temperature, T_g , which is the temperature below which the elastomeric composition becomes "glass-like" or brittle.

5 With present testing technology, these viscoelastic parameters can be determined with great precision, and these parameters can be confidently correlated to practical performance characteristics in, say, tires. For instance, with tire tread compounds, the $\tan \delta$ of a compound, measured within a temperature range of about 50-70 °C, correlates directly with the rolling resistance of a tire. That is, the lower the $\tan \delta$, the lower the
10 rolling resistance of a tire tread. Similarly, the magnitude of the $\tan \delta$ or E'' , measured at about 0 °C, or at the respective T_g of a tire tread compound, relate to certain traction characteristics of a tire, whereas the magnitude of the $\tan \delta$ at very low temperatures of about -65 °C is indicative of the abrasion or wear characteristics of a tire tread. Regarding traction and wear, the greater the values of the respective viscoelastic parameters, the
15 better the performance of the compounds in tire treads.

To be specific, with respect to predicting the potential rolling resistance of tire tread compounds, differences in $\tan \delta$ of 0.005 are significant and beyond experimental error, while changes of 0.015 and greater are significant with respect to certain traction characteristics and can be observed in actual tire performance tests.

20 In practice, there are opposing performance trends of elastomeric compounds, which usually requires compromises when optimizing their viscoelastic properties. For instance, improvements in the $\tan \delta$ leading to a lower rolling resistance of tire tread compounds are generally also accompanied by a reduction of $\tan \delta$ at other relevant temperatures, thus resulting in a potentially lower wet traction performance of the tire
25 tread. Similarly, there are generally also opposing trends with respect to certain properties, such as traction capabilities of tire tread compounds and their abrasion or wear resistance characteristics.

Much effort has been spent on developing compounding technologies and new compound additives to ameliorate this problem of opposing property trends while raising
30 the overall performance levels. Great progress has been made through what is now commonly referred to as "silica compounding" technology, but there is still need for further technical improvements. The present invention demonstrates that this is now

possible.

Disclosure of the Invention

The present invention relates generally to the field of vulcanizable elastomeric compositions.

5 In one aspect, an improved elastomeric composition includes 100 parts by weight of at least one diene-based elastomer, and from 30 to 160 phr of filler, the filler comprising at least about 7 phr of zinc sulfate.

In another aspect, an improved elastomeric composition includes 100 parts by weight of at least one diene-based elastomer, and from 30 to 160 phr of filler, the filler
10 comprising at least 7 phr barium sulfate.

In yet another aspect, the improved elastomeric composition includes 100 parts by weight of at least one diene-based elastomer, and from about 30 to 160 parts of filler, the filler comprising at least 8 phr titanium dioxide, and also containing at least one compound selected from the group consisting of silica, carbon black, clay, calcium
15 carbonate, and talc.

The mean particle size of zinc sulfate, barium sulfate and titanium dioxide particles is between about 0.2 and 1.6 microns and accounts for between 10 and 30 weight percent of the filler.

Accordingly, the general object of the invention is to provide improved vulcaniz-
20 able elastomeric compositions.

Another object is to provide improved elastomeric compositions employing zinc sulfate, barium sulfate or titanium dioxide as filler material.

These and other objects and advantages will become apparent from the foregoing and ongoing written specification, and the appended claims.

25

Description of the Preferred Embodiments

The present invention deals with a novel compounding technology through the use of a new class of additives. As a result, the opposing property trends of conventional elastomeric compounds are minimized, while the overall performance level of com-
30 pounds is greatly improved.

In general, the nature of the elastomer determines the basic properties of vulcanizable elastomeric compounds. With current technologies, these properties are

modified by the kind and amount of compounding ingredients that are used. These ingredients include processing aids, fillers, softeners, vulcanizing chemicals, chemicals protecting against aging, blowing agents, etc. All these conventionally-used materials are compatible with compounds of the present invention. However, the present invention
5 uses an new group of compounding aids to achieve the desired novel balance and level of viscoelastic properties.

Commonly-used elastomers, which are compatible with the novel compounding technology of this invention, include natural rubber, or synthetic elastomers, based on mono, copolymers or terpolymers from butadiene, isoprene, isobutylene, styrene, acrylo-
10 nitrile, chlorobutadiene, ethylene, propylene, dicyclopentadiene, ethylene norbornene, hexadiene, vinyl acetate, chlorosulfonyl ethylene, epichlorohydrin, ethylene oxide, or propylene oxide. Blends from these elastomers can also be employed within useful blend ratios. In addition fluoroelastomers, silicone rubbers, polysulfide rubbers, and polyurethane rubbers are also compatible with the compounding technology of this
15 invention.

Fillers, which are compatible with the novel compounding technology of this invention can be generally classified as carbon blacks or light-colored fillers. The carbon blacks comprise a wide range of grades, and there is no restriction on surface area, surface activity, particle size, or aggregate structure. Light fillers include colloidal
20 silica, calcium silicate, aluminum silicate, alumina gel, clay, talcum, or calcium carbonate (*i.e.*, chalk). Again, there is no restriction on the particle size, aggregate size, or the surface activity of these light fillers. The surface activity of carbon blacks and light fillers can also be modified with appropriate chemicals according to current technologies. It is also possible to employ blends of carbon black grades, light fillers, or carbon
25 blacks and light fillers in compounds of the present invention.

It is also possible to use plasticizers, process aids, factices, mineral oils, bonding resins, reinforcing resins, tackifiers, blowing agents and various aging-, fatigue-, and ozone- protective agents.

The elastomeric compositions of this invention can be vulcanized using current
30 technologies. These include accelerated sulfur systems, sulfur donors, peroxides, curing resins and high energy radiation. Combinations of any of these systems can also be employed.

The following examples will illustrate the nature of the novel compounding technology. In these examples, all compounds contained 100 parts by weight of at least one diene-based elastomer.

5 Example 1:

Six compounds were prepared under identical conditions to demonstrate the properties of rolling resistance, traction, and wear of tire tread compounds using modern compounding technology based on carbon black and silica fillers, and the significant and unexpected improvements that can be obtained with the compounding technology of the present invention.

All compounds had the same type and concentration of elastomers, namely a blend of two solution SBR's (synthetic styrene-butadiene rubber), and the same sulfur/accelerator cure system, protective agents, oils, and process aids. The total filler concentration was held constant at 35% by weight throughout, but different filler types were used.

Compound A (Control 1) is a modern low-rolling-resistance, high traction passenger tire tread, based on the latest silica compounding technology. Here, the filler was a blend of 45 phr silica with a surface area of 180 m² per gram of silica. The surface of the silica was modified with a silane coupling agent and of 25 phr carbon black (ASTM grade N134), which has a high surface area and high structure (*i.e.*, degree of aggregation of primary particles).

Compound B (Control 2) is a modern long-wearing, high-traction passenger tread compound using carbon black filler only (70 phr of ASTM Grade N134).

Compound C (Control 3) is a modern high-traction, low-rolling-resistance passenger tread using carbon black filler with lower surface area than that of Control 1 (a blend of 35phr of ASTM GradeN343 carbon black, and 35 phr of ASTM Grade N351 carbon black).

Compounds D, E and F were compounded using the novel technology of this invention. The fillers in Compound D were 61.5 phr carbon black (*i.e.*, blend of N343 and N351) plus 8.5 phr zinc sulfate with mean particle size of 0.7 microns. In Compound E, the fillers were 61.7 phr carbon black (blend of N343 and N351) plus 8.3 phr barium sulfate with mean particle size of 1.6 microns. In Compound F, the fillers were

60.8 phr carbon black (blend of N343 and N351) plus 9.2 phr titanium dioxide of mean particle size of 0.2 microns.

The viscoelastic properties of these six compounds were determined using a Rheometrics RSA dynamic tester in uniaxial extension over a temperature range from -70 °C to +60 °C, and a dynamic strain amplitude of 0.5% with a 10% prestrain at a frequency of 10 Hertz. From these measurements, the glass transition temperature T_g and the $\tan \delta$ values at -25 °C, 0 °C and 50 °C were determined. These data are summarized in Table 1:

Table 1:

	Compound A Control 1	Compound B Control 2	Compound C Control 3	Compound D	Compound E	Compound F
T_g °C	-28.4	-28.1	-30.1	-28.3	-28.5	-28.2
$\tan \delta$ @50 °C	0.20	0.28	0.23	0.19	0.19	0.19
$\tan \delta$ @ 0 °C	0.34	0.44	0.37	0.32	0.34	0.33
$\tan \delta$ @ -25°C	0.86	0.92	0.96	0.90	0.90	0.87

When comparing the results for the Compound A (silica filler) and Compound B (high surface area carbon black), the predicted advantage of Compound A for lower rolling resistance (lower $\tan \delta$ @ 50 °C) is obvious, albeit at the expense of traction (lower $\tan \delta$ @ 0 °C) and treadwear.

If we next compare Compound B (high surface area carbon black) and Compound C (carbon black with lower surface area), we observe the expected improvement in rolling resistance, although not to the level of the silica compound (Compound A), but a reduced level of traction.

Therefore, these data demonstrate the limitations of current compounding technology due to the opposing property trends as mentioned above.

Now consider the significant results for Compounds D, E and F, which incorporate the technology of the present invention. Here, the consistently lowest $\tan \delta$ @ 50 °C values (lowest rolling resistance) is apparent even when compared to the silica

compound (Control 1), without sacrificing traction or wear. It should also be noted that the compounds based on the technology of this invention offer significant cost savings over silica-based compounds.

5 Example 2:

This example was included to demonstrate that the technology of the present invention can also beneficially be applied to compounds formulated with a different elastomer system, and that compounds with a high-surface-area carbon black can also be significantly improved with respect to rolling resistance at largely equivalent traction capabilities.

To this end, five compounds were prepared under identical conditions. Common to all compounds was the elastomer system, namely a blend of 70 parts by weight of two solution SBR's (synthetic styrene-butadiene rubber) and 30 parts by weight of natural rubber. The same protective agents, oils, and process aids and sulfur/accelerator cure system were also used throughout, but for the silica-based Compound A, the sulfur/accelerator ratio had to be adjusted to maintain equivalent cure rates of the compounds in this series. The total filler concentration was held constant at 33% by weight throughout, but different filler types were used.

Compound A (Control 1) is based on the latest silica compounding technology to give a very low-rolling-resistance, high traction passenger tire tread. Here, the filler was a blend of 45 phr silica with a surface area of 180 m² per gram of silica. The surface of the silica was modified with a silane coupling agent and of 25 phr carbon black (ASTM grade N134), which has a high surface area and high structure.

Compound B (Control 2) represents a long-wearing, high-traction passenger tread compound using carbon black filler only (70 phr N134).

Compounds C, D and E were compounded using the novel technology of this invention. The fillers in Compound C were 61.5 phr carbon black (N134) plus 8.5 phr zinc sulfate with mean particle size of 0.7 microns. In Compound D, the fillers were 61.7 phr carbon black (N134) plus 8.3 phr barium sulfate with mean particle size of 1.6 microns. In Compound E, the fillers were 60.8 phr carbon black (N134) plus 9.2 phr titanium dioxide of mean particle size of 0.2 microns.

The viscoelastic properties of these five compounds were determined using the

same test conditions as listed in Example 1. From these measurements, the glass transition temperature T_g and the $\tan \delta$ values at 0 °C and 50 °C were determined. These data are summarized in Table 2:

Table 2:

	Compound A Control 1	Compound B Control 2	Compound C	Compound D	Compound E
T_g °C	-28.4	-28.1	-28.3	-28.5	-28.2
$\tan \delta$ @ 50 °C	0.19	0.29	0.27	0.26	0.25
$\tan \delta$ @ 0 °C	0.32	0.44	0.43	0.43	0.41

The results demonstrate again the opposing property trends, which cannot be eliminated with current compounding technology. Compared with the high-surface-area carbon black compound (Control 2), the silica compound (Control 1) has a significantly lower rolling resistance in passenger tire treads (*i.e.*, lower $\tan \delta$ @ 50 °C) but at considerable expense of tire tread traction (*i.e.*, lower $\tan \delta$ @ 0 °C).

On the other hand, compared with Control 2, the compounds based on the technology of the present invention (Compounds C, D and E) have a significantly lower rolling resistance (*i.e.*, lower $\tan \delta$ @ 50 °C) without the precipitous loss in traction (*i.e.*, $\tan \delta$ @ 0 °C).

Therefore, while certain specific compositions have been specifically described, and certain changes and modifications discussed, persons skilled in this art will readily appreciate that various additional changes and modifications thereof may be made without departing from the spirit of the invention, as defined and differentiated by the following claims.

Amended Claims

1. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least 7 phr of zinc sulfate
to modify the viscoelastic properties of said elastomer.
2. A tire tread as set forth in claim 1 wherein the mean the particle size of said zinc sulfate is
between about 0.5 and about 1.0 microns.
3. A tire tread as set forth in claim 1 wherein the said filler includes carbon black.
4. A tire tread as set forth in claim 1 wherein the said filler includes silica.
5. A tire tread as set forth in claim 1 wherein the aggregate amount of zinc sulfate in said filler
is less than about 30 percent of the volume of said filler.
6. A tire tread as set forth in claim 1 wherein the aggregate amount of zinc sulfate is between
10 and about 30 percent by weight of said filler.
7. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least about 7 phr of barium
sulfate, wherein the aggregate amount of barium sulfate in said filler is less than about 30 percent
of the volume of said filler and the aggregate amount of barium sulfate is between about 10 and
about 30 percent by weight of said filler, and wherein the mean particle size of said barium sulfate
is between about 1.0 and about 2.0 microns to modify the viscoelastic properties of said elastomer.
8. (Cancelled)

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(10)

9. A tire tread as set forth in claim 7 wherein the said filler includes carbon black.
10. A tire tread as set forth in claim 7 wherein the said filler includes silica.
11. (Cancelled)
12. (Cancelled)
13. (Cancelled)
14. A tire tread, comprising:
100 parts by weight of at least one diene-based elastomer; and
from about 30 to about 160 phr of filler, said filler comprising at least about 8 phr of titanium dioxide, the mean particle size of said titanium dioxide being between about 0.5 and about 1.0 microns, and wherein the aggregate amount of titanium dioxide in said filler is less than about 30 percent of the volume of said filler and the aggregate amount of titanium dioxide is between 10 and about 30 percent by weight of said filler to modify the viscoelastic properties of said elastomer.
15. (Cancelled)
16. A tire tread as set forth in claim 14 wherein the said filler includes carbon black.
17. A tire tread as set forth in claim 14 wherein the said filler includes silica.
18. (Cancelled)
19. (Cancelled)

COMBINED DECLARATION AND POWER OF ATTORNEY
(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT,
SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type: (check one applicable item below)

☒ original

☐ design

☐ supplemental

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

☒ national stage of PCT

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. §1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

☐ divisional

☐ continuation

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. §1.53(b) (application filing requirements - nonprovisional application).

☐ continuation-in-part (C-I-P)

INVENTORSHIP IDENTIFICATION

WARNING: If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

VULCANIZABLE ELASTOMERIC COMPOSITIONS FOR USE AS TIRE TREADS

SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b) OR (c))

(a) ☒ is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) ☐ was filed on _____, as Serial No. _____ or ☐ _____
_____ and was amended on _____ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and application number (consisting of the series code and the serial number; e.g., 08/123,456;

"(2) name of inventor(s), serial number and filing date;

"(3) name of inventor(s) and attorney docket number which was on the specification as filed;

"(4) name of inventor(s), title which was on the specification as filed and filing date;

"(5) name of inventor(s), title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(6) name of inventor(s), title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number; e.g. 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

Notice of July 13, 1995 (1177 O.G. 60), M.P.E.P. § 601.01(a), 6th ed., rev. 3.

(c) ☒ was described and claimed in PCT International Application No. PCT/US9908838, filed on April 22, 1999 and as amended under PCT Article 19 on November 3, 2000 (if any).

SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))

(complete the following where a supplemental declaration is being submitted)

☐ I hereby declare that the subject matter of the

☐ attached amendment

☐ amendment filed on _____

identified, for such invention.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

☒ [X] and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

☐ [] In compliance with this duty there is attached an information disclosure statement in accordance with 37 CFR 1.98.

PRIORITY CLAIM (35 U.S.C. §§ 119(a)-(d))

NOTE: "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the Examiner, when specifically required by the Examiner, and in all situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the Examiner, or when specifically required by the Examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) ☒ [x] no such applications have been filed.

(e) ☐ [] such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
	None		<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)
(35 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER

FILING DATE

CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S)
UNDER 35 U.S.C. 120

- ☐ The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P) APPLICATION.

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

NONE

NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Peter K. Sommer, Reg. No. 26,587 and Rowland Richards, Reg. No. 42,104, with full power of substitution and revocation.

(check the following item, if applicable)

☐ I hereby appoint the following practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

SEND CORRESPONDENCE TO

DIRECT TELEPHONE CALLS TO:
(NAME AND TELEPHONE NUMBER)

Peter K. Sommer, Esq.
Phillips, Lytle, Hitchcock, Blaine & Huber LLP
Intellectual Property Group
3400 HSBC Center
Buffalo, New York 14203

Peter K. Sommer, Esq.
(716) 847-8345

Customer Number _____

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

Full name of sole or first inventor:

1-00 LOUIS F. GATTI
(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature Louis F. Gatti
Date Oct. 15, 2001 Country of Citizenship USA
Residence 1942 Majorie Road, Grand Island, New York 14072 NY
Post Office Address same

Full name of second joint inventor, if any:

(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature _____
Date _____ Country of Citizenship _____
Residence _____
Post Office Address _____

Full name of third joint inventor, if any:

(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature _____
Date _____ Country of Citizenship _____
Residence _____
Post Office Address _____

(check proper box(es) for any of the following added page(s)
that form a part of this declaration)

☐ Signature for fourth and subsequent joint inventors. NUMBER OF PAGES ADDED
_____.

* * *

☐ Signature by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. NUMBER OF PAGES ADDED _____.

* * *

☐ Signature for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. NUMBER OF PAGES ADDED _____.

* * *

☐ Added page for signature by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time (37 CFR 1.47).

* * *

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added _____

* * *

☐ Authorization of practitioner(s) to accept and follow instructions from representative.

* * *

(if no further pages form a part of this Declaration,
then end this Declaration with this page and check the following item:)

☒ This declaration ends with this page.